AEOLIAN FEATURES IN THE MEDUSAE FOSSAE FORMATION: A HIRISE SURVEY.
L. Kerber[1], J. W. Head[2], F. Forget[1] [1]Laboratoire de Météorologie Dynamique du CNRS, Université Paris 6, Paris, France (Kerber@lmd.jussieu.fr), [2]Department of Geological Sciences, Brown University, Box 1846 Providence RI 02912

Introduction: The Medusae Fossae Formation is a voluminous, fine-grained unit located along the equator between the Elysium and Tharsis volcanic complexes [1-4]. While mapped as Amazonian in age, recent stratigraphic analysis has suggested that parts of the unit were emplaced at the latest in the Hesperian [5]. Many different types of aeolian features are present within the formation, including transverse aeolian ridges (TARs) [6] dark-colored dunes [7], yardangs [8], and horseshoe-shaped erosional pits [9]. Unlike other regions of Mars, the Medusae Fossae Formation appears to host a large number of indurated, cratered, and degraded aeolian features [6]. In addition to aeolian geomorphological features, complex inverted fluvial networks have been discovered [10,11], fueling new interest in the deposit and its history. One inherent difficulty in studying particular geomorphological features in a large unit such as the Medusae Fossae Formation is finding appropriate examples of often small-scale features amid the large number of available High Resolution Imaging Science Experiment (HiRISE) images spread across thousands of kilometers. For this reason we have conducted a survey of all of the 427 HiRISE images available as of March 1, 2012 in the region of the Medusae Fossae Formation, noting the appearance of aeolian and other geomorphological features of potential interest to other researchers, including: yardangs, morphologically fresh TARs, indurated TARs, black sand, horseshoe or v-shaped scours, layers, jointing, rootless cones, sublimation terrain, fluvial features, fish-scale terrain, thin, cross-hatched ridges (dubbed "inverted fish-scale terrain"), and "faceted" terrain [as defined in 6].

Methods: Each image was analyzed at high resolution using IAS Viewer or HiView, available from the HiRISE website, and observed geomorphological features were plotted on a map of the Medusae Fossae Formation using the geographical information system software ArcGIS. Type examples of each feature were selected to aid in the consistency of feature identification. In some cases (such as with yardangs), it was found that the morphology of a feature changed across the deposit. In these cases several type examples were chosen to showcase the morphological variability across the deposit.

Results: TARs were found throughout the deposit, as were yardangs, except for in the thickest parts of Eumenides Dorsum and in northwestern Lucus Planum [see also 9]. Fresh TARs were more commonly found in the western parts of the deposit compared with the eastern parts of the deposit (**Figure 1a**). Faceted terrain dominates over both fresh and indurated TARs in the thick, eastern outcrops of the formation. Horseshoe-shaped scours also increase in number in the eastern parts of the deposit (**Figure 1b**). Black sand was found widely in the formation, often inside large craters or next to lava plains (**Figure 1c**). Fluvial features were found dominantly in lower Zephyria Planum region, but several outlying fluvially-modified terrains were discovered elsewhere in the formation.

While dust mantling was not originally a primary feature of interest, it became apparent that much of northwestern parts of the Medusae Fossae, especially in Gordii Dorsum, are heavily mantled with dust. The formation was also found to underlie the thick Olympus Mons aureole in this region. The "reticulate" morphology described by [12] for high altitude regions of Mars is common in these dust-mantled areas. Jointing was found to be much less common than previously hypothesized [3]. The resulting maps of geomorphological features can be used as an aid in finding new instances of a feature of interest as well as providing the spatial context for a feature with respect to other features and surrounding units.

References: : [1] Scott, D.H., Tanaka, K.L. (1986) *USGS Misc. Inv. Series Map* I-1802-B. [2] Greeley, R., Guest, J. (1987) *USGS Misc. Inv. Series* Map I-1802-B. [3] Bradley, B.A. et al. (2002) *JGR 107,* E8. [4] Zimbelman, J.R., Griffin, L.J. (2010) *Icarus 205*, 198-210. [5] Kerber, L., Head, J.W. (2010) *Icarus 206,* 669-684. [6] Kerber, L., Head, J.W. (2011) *Earth Surf. Process. Landforms* doi: 10.1002/esp.2259. [7] Burr, D.M. et al. (2012) *LPSC 43*, Abs. 1692. [8] Ward, A. (1979) *J. Geophys. Res. 84*, B14. [9] Mandt, K. et al. (2009) *Icarus 204*, 471-477. [10] Burr, D.T. et al. (2009) Icarus 200, 52-76. [11] Burr, D.T. et al. (2010) J. Geophys. Res. 115, E07011. [12] Bridges, N.T. et al. (2007) *Geophys. Res. Lett. 34*, L23205.

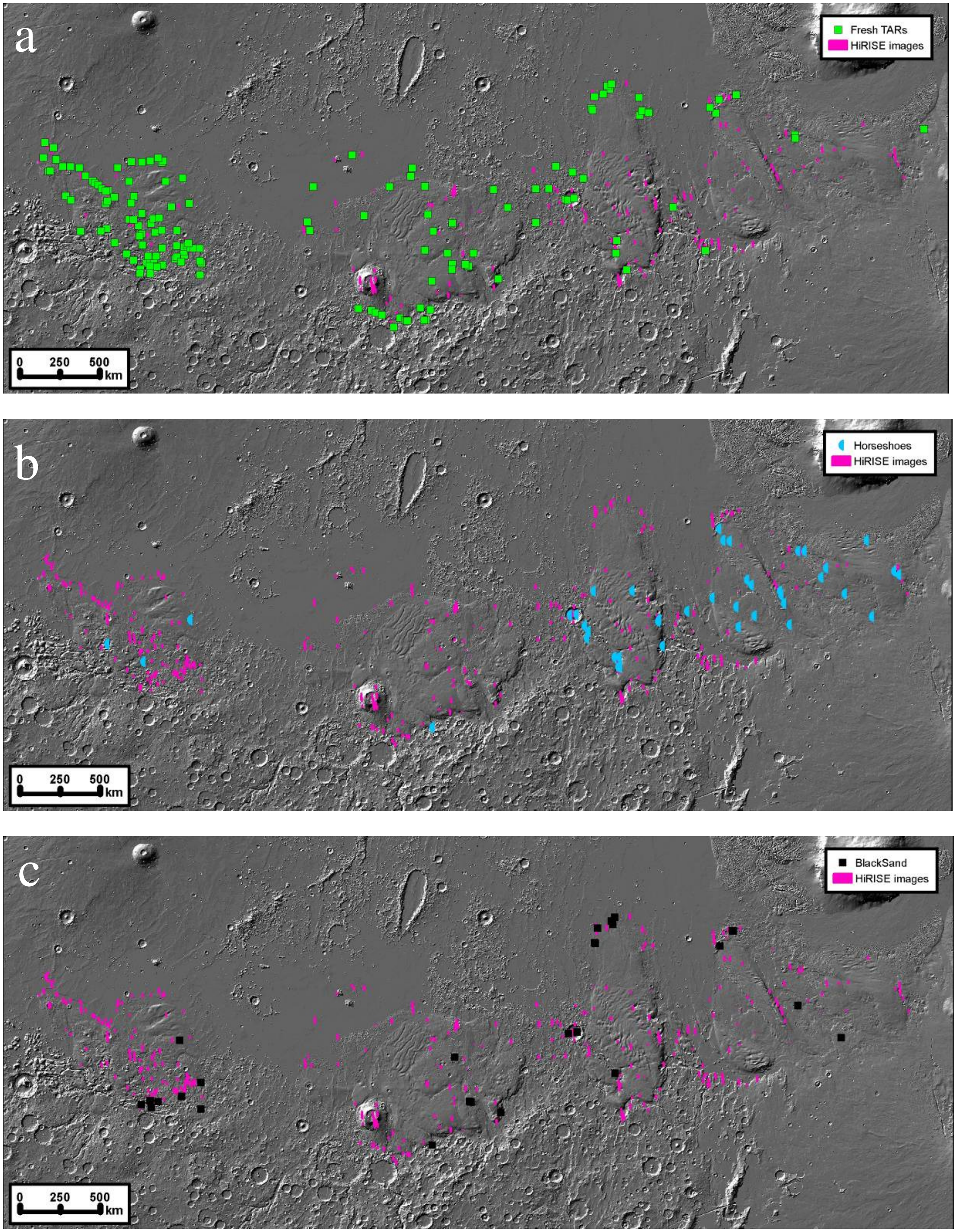

Figure 1. Distribution maps for various aeolian features in the Medusae Fossae Formation. a) Fresh transverse aeolian ridges (TARs). b) Horseshoe or v-shaped depressions. c) Collections of dark-colored sediment. In each case, the fuchsia marks represent the outlines of available HiRISE images used in the survey.